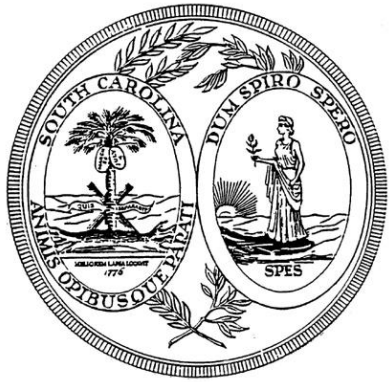
South Carolina Academic Standards and Performance Indicators for Science 2014



Instructional Unit Resource

5th Grade

South Carolina Academic Standards and Performance Indicators for Science 2014
Fifth Grade Science Instructional Unit Resource

As support for implementing the *South Carolina Academic Standards and Performance Indicators for Science 2014*, the standards for Fifth Grade have been grouped into possible units. In the Overview of Units below, the titles for those possible units are listed in columns. Refer to the Overview document to note these unit titles and how Standards, Conceptual Understandings, Performance Indicators, Science and Engineering Practices, and Crosscutting Concepts align. Following the Overview of Units, an Instructional Unit document is provided that delivers guidance and possible resources in teaching our new *South Carolina Academic Standards and Performance Indicators for Science 2014*. The purpose of this document is to provide guidance as to how all the standards in this grade may be grouped into units and how those units might look. Since this document is merely guidance, districts should implement the standards in a manner that addresses the district curriculum and the needs of students. This document is a living document and instructional leaders from around the state will continuously update and expand these resource documents. These documents will be released throughout the 2016-2017 school year with the intentionality of staying ahead of instruction. Teachers should also note that links to the Standards document, A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas, the SEP Support Document, and the Support Document 2.0 are embedded throughout the Instructional Unit format for reference.

Acknowledgments

Jean Baptiste Massieu, famous deaf educator, made a statement that is now considered a French proverb. “Gratitude is the memory of the heart. Indeed, appreciation comes when you feel grateful from the depths of your heart. The head keeps an account of all the benefits you received and gave. But the heart records the feelings of appreciation, humility, and generosity that one feels when someone showers you with kindness.” It is with sincere appreciation that we humbly acknowledge the dedication, hard work and generosity of time provided by teachers and instructional leaders across the state that have made and are continuing to make the Instructional Unit Resources possible.

Grade 5 Overview of Units

Unit 1		Unit 2		Unit 3		Unit 4
PHYSICAL SCIENCE: MATTER AND MIXTURES		EARTH SCIENCE: CHANGES IN LANDFORMS AND OCEANS		LIFE SCIENCE: INTERDEPENDENT RELATIONSHIPS		PHYSICAL SCIENCE: FORCES AND MOTIONS
Standard		**Standard**		**Standard**		**Standard**
5.P.2		5.E.3		5.L.4		5.P.5
Conceptual Understanding		**Conceptual Understanding**		**Conceptual Understanding**		**Conceptual Understanding**
5.P.2.A	5.P.2B	5.E.3A	5.E.3B	5.L.4A	5.L.4B	5.P.5A
Performance Indicators		**Performance Indicators**		**Performance Indicators**		**Performance Indicators**
5.P.2.A.1 5.P.2.A.2	5.P.2B.1 5.P.2B.2 5.P.2B.3 5.P.2B.4 5.P.2B.5 5.P.2B.6	5.E.3A.1 5.E.3A.2	5.E.3B.1 5.E.3B.2 5.E.3B.3 5.E.3B.4	5.L.4A.1 5.L.4A.2	5.L.4B.1 5.L.4B.2 5.L.4B.3 5.L.4B.4	5.P.5A.1 5.P.5A.2 5.P.5A.3 5.P.5A.4 5.P.5A.5
***Science and Engineering Practices**		***Science and Engineering Practices**		***Science and Engineering Practices**		***Science and Engineering Practices**
5.S.1A.2 5.S.1A.3 5.S.1A.4 5.S.1A.6 5.S.1A.7 5.S.1A.8		5.S.1A.1 5.S.1A.2 5.S.1A.3 5.S.1A.4 5.S.1A.6 5.S.1A.8		5.S.1A.2 5.S.1A.4 5.S.1A.6 5.S.1A.7 5.S.1A.8		5.S.1A.1 5.S.1A.2 5.S.1A.3 5.S.1A.4 5.S.1A.7 5.S.1A.8
***Crosscutting Concepts**		***Crosscutting Concepts**		***Crosscutting Concepts**		***Crosscutting Concepts**
2,4,5,7		1,2,4,5,7		1,2,5		2,3,4,7

**Teachers have the discretion to enhance the selected SEP's and CCCs.*

Unit Title
Physical Science: Matter and Mixtures
Standard
5.P2 Thee student will demonstrate an understanding of the physical properties of matter and mixtures.

Conceptual Understanding
5.P.2A Matter is made up of particles that are too small to be seen. Even though the particles are very small, the movement and spacing of these particles determines the basic properties of matter.
New Academic Vocabulary **Some students may need extra support with the following academic vocabulary in order to understand what they are being asked to understand and do. Teaching these terms in an instructional context is recommended rather than teaching the words in isolation. A great time to deliver explicit instruction for the terms would be during the modeling process. Ultimately, the student should be able to use the academic vocabulary in conversation with peers and teachers. These terms are pulled from the essential knowledge portion of the Support Doc 2.0 (http://ed.sc.gov/instruction/standards-learning/science/support-documents-and-resources/) and further inquiry into the terms can be found there.**
Matter Mass Volume Density Particle Change Particle Size
Performance Indicators **Text highlighted below in *orange* and *italicized/underlined* shows connections to SEP's**
5.P.2A.1 *Analyze and interpret data* from observations and measurements of the physical properties of matter (including volume, shape, movement, and spacing of particles) to explain why matter can be classified as a solid, liquid or gas.
***Science and Engineering Practices** **Support for the guidance, overviews of learning progressions, and explicit details of each SEP can found in the Science and Engineering Support Doc (http://ed.sc.gov/scdoe/assets/File/instruction/standards/Science/Support%20Documents/Complete_2014SEPsGuide_SupportDoc2_0.pdf). It is important that teachers realize that the nine science and engineering practices are not intended to be used in isolation. Even if a performance indicator for a given standard only lists one of the practices as a performance expectation, scientists and engineers do not use these practices in isolation, but rather as part of an overall sequence of practice. When educators design the learning for their students, it is important that they see how a given performance expectation fits into the broader context of the other science and engineering practices. This will allow teachers to provide comprehensive, authentic learning experiences through which students will develop and demonstrate a deep understanding of scientific concepts.**

5.S.1.A.4 Analyze and interpret data from informational texts, observations, measurements, or investigations using a range of methods (such as tabulation or graphing) to (1) reveal patterns and construct meaning or (2) support hypotheses, explanations, claims, or designs.

***Cross Cutting Concepts** **(http://www.nap.edu/read/13165/chapter/8)**

The link above provides support from the Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas (2012) The text in blue and *italicized/underlined* below provides a brief explanation of how the specific content ties to the CCC's.

4. Systems and System Models: The National Research Council (2012) states "defining the system under study—specifying its boundaries and making explicit a model of that system—provides tools for understanding and testing ideas that are applicable throughout science and engineering" (p. 84). *Properties and arrangements of atoms (particles) form the states of matter.*

5. Energy and Matter: The National Research Council (2012) states "tracking fluxes of energy and matter into, out of, and within systems helps one understand the systems' possibilities and limitations" (p. 84). *Matter is evident in three main states: solid, liquid, and gas based on their properties. In order to change the state of matter, energy must be added or removed.*

**Teachers have the discretion to enhance the selected SEP's and CCC's.*

Prior Knowledge

- K.P.4 Properties of Matter
- 2.P.3 Solids, Liquids, Gases
- 3.P.2 Properties of Matter

Subsequent Knowledge

- 7.P.2 Properties of Matter

Possible Instructional Strategies/Lessons

Strategies and lessons that will enable students to master the standard and/or indicator.

- Measuring Volume by Water Displacement Students figure out how to measure volume of irregular shapes. This video provides the hands-on activity as a visual to students to measure volume. Teachers can do the same experiment in class with students. This resource can be found at: https://www.teachingchannel.org/videos/measuring-volume-lesson

- Freezing Liquid Video and experiment on freezing liquids-states of matter. This resource can be found at: http://www.stevespanglerscience.com/lab/experiments/science-fair-freezing-liquids/.

- Making Butter, Fixx Ball, and Create Goo Three hands-on activities to enforce states of matter. These resources can be found at: http://www.superteacherideas.com/science7-matter.html.

Resources

- States of Matter Rap Arts integrated rap/song to reinforce key terms associated with solids, liquids, and gases. This resource can be found at: http://www.bing.com/videos/search?q=states+of+matter+rap&view=detail&mid=6F1A0B995750275441E66F1A0B995750275441E6&FORM=VIRE

- Properties of Matter Informative slideshare containing information about states of matter. This resource can be found at: http://www.slideshare.net/dsacre/properties-of-matter-ppt

- States of Matter Facts Informative page displaying vocabulary and illustrations of the states of matter. This resource can be found at http://www.coolkidfacts.com/states-of-matter-for-kids/

- All About States of Matter Informative pages displaying states of matter facts and terms. Contains video clip of the states of matter. This resource can be found at http://easysciencefor kids.com/all-about-states-of-matter/

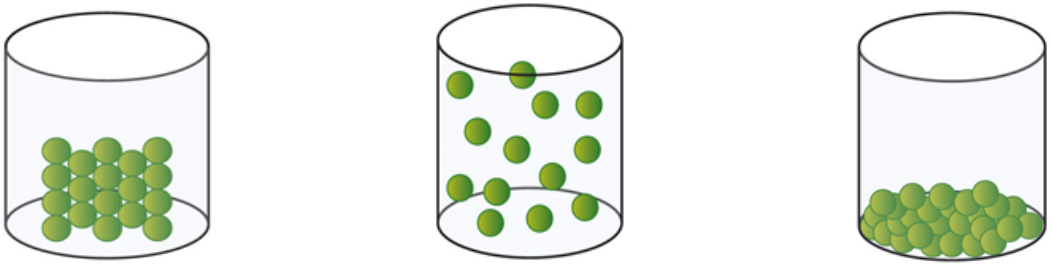
- States of Matter This site includes videos, lessons, illustrations, and activities on states of matter. This resource can be found at https://www.brainpop.com/science/matterandchemistry/statesofmatter/

Sample Formative Assessment Tasks/Questions

Additional sample formative assessment tasks/questions for grade bands are located at the end of each of the SEP Support Doc (http://ed.sc.gov/scdoe/assets/File/instruction/standards/Science/Support%20Documents/Complete_2014SEPsGuide_SupportDoc2_0.pdf)

- Analyze and interpret data about states of matter. Classify items as solid, liquid, or gas determined by assorted containers. Classify states of matter based on diagrams of movement and placement of molecules.

- The containers below show models of a solid, a liquid, and a gas. Observe and analyze the three models and label each as a solid, liquid, or gas. Explain why you have classified each as a solid, liquid or gas based on volume, shape, and movement and spacing of particles.



Unit Title
Physical Science: Matter and Mixtures
Standard
5.P2 The student will demonstrate an understanding of the physical properties of matter and mixtures.

Conceptual Understanding
5.P.2B. A mixture is formed when two or more kinds of matter are put together. Sometimes when two or more different substances are mixed together, a new substance with different properties may be formed but the total amount (mass) of the substances is conserved. Solutions are a special type of mixture in which one substance is dissolved evenly into another substance. When the physical properties of the components in a mixture are not changed, they can be separated in different physical ways.
New Academic Vocabulary **Some students may need extra support with the following academic vocabulary in order to understand what they are being asked to understand and do. Teaching these terms in an instructional context is recommended rather than teaching the words in isolation. A great time to deliver explicit instruction for the terms would be during the modeling process. Ultimately, the student should be able to use the academic vocabulary in conversation with peers and teachers. These terms are pulled from the essential knowledge portion of the Support Doc 2.0 (http://ed.sc.gov/instruction/standards-learning/science/support-documents-and-resources/) and further inquiry into the terms can be found there.**

Mixture	Solution	Stirring	Solute	Solvent
Solubility	Concentration	Particle size	Floatation	Magnetism
Chromatography	Sifting	Filtration	Evaporation	Alloy
Homogenous mixture				

Performance Indicators

Text highlighted below in *orange* and *italicized/underlined* shows connections to SEP's

5.P.2B.1 *Obtain and communicate* information to describe what happens to the properties of substances when two or more substances are mixed together.

5.P.2B.2 *Analyze and interpret* data to support claims that when two substances are mixed the total amount (mass) of the substances does not change.

5.P.2B.3 *Develop models* using observations to describe mixtures, including solutions, based on their characteristics.

5.P.2B.4 *Construct explanations* for how the amount of solute and the solvent determine the concentration of a solution

5.P.2B.5 *Conduct controlled scientific investigations* to test how different variables (including temperature change, particle size, and stirring) affect the rate of dissolving.

5.P.2B.6 *Design and test* the appropriate method(s) (such as filtration, sifting, attraction to magnets, evaporation, chromatography, or floatation) for separating various mixtures to describe what happens to the properties of substances when two or more substances are mixed together.

***Science and Engineering Practices**

Support for the guidance, overviews of learning progressions, and explicit details of each SEP can found in the Science and Engineering Support Doc (http://ed.sc.gov/scdoe/assets/File/instruction/standards/Science/Support%20Documents/Complete_2014SEPsGuide_SupportDoc2_0.pdf). It is important that teachers realize that the nine science and engineering practices are not intended to be used in isolation. Even if a performance indicator for a given standard only lists one of the practices as a performance expectation, scientists and engineers do not use these practices in isolation, but rather as part of an overall sequence of practice. When educators design the learning for their students, it is important that they see how a given performance expectation fits into the broader context of the other science and engineering practices. This will allow

teachers to provide comprehensive, authentic learning experiences through which students will develop and demonstrate a deep understanding of scientific concepts.
5.S.1.A.2 Develop, use, and refine models to (1) understand or represent phenomena, processes, and relationships, (2) test devices or solutions, or (3) communicate ideas to others. 5.S.1A.3 Conduct controlled scientific investigations Plan and conduct controlled scientific investigations to answer questions, test hypotheses and predictions, and develop explanations: (1) formulate scientific questions and testable hypotheses, (2) identify materials, procedures, and variables, (3) select and use appropriate tools or instruments to collect qualitative and quantitative data, and (4) record and represent data in an appropriate form. Use appropriate safety procedures. 5.S.1.A.4 Analyze and interpret data from informational texts, observations, measurements, or investigations using a range of methods (such as tabulation or graphing) to (1) reveal patterns and construct meaning or (2) support hypotheses, explanations, claims, or designs 5.S.1.A.6 Construct explanations of phenomena using (1) scientific evidence and models, (2)conclusions from scientific investigations, (3) predictions based on observations and measurements, or (4) data communicated in graphs, tables, or diagrams. 5.S.1A.8 Obtain and evaluate informational texts, observations, data collected, or discussions to (1) generate and answer questions, (2) understand phenomena, (3) develop models, or (4) support hypotheses, explanations, claims, or designs. Communicate observations and explanations using the conventions and expectations of oral and written language.
***Cross Cutting Concepts** **(http://www.nap.edu/read/13165/chapter/8)** **The link above provides support from the Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas (2012) The text in blue and *italicized/underlined* below provides a brief explanation of how the specific content ties to the CCC's.**
2. Cause and Effect: The National Research Council (2012) states "events have causes, sometimes simple, sometimes multifaceted. A major activity of science is investigating and explaining causal relationships and the mechanisms by which they are mediated. Such mechanisms can then be tested across given contexts and used to predict and explain events in new contexts" (p. 84). *Effects of mixtures are based on properties and physical change.* 5. Energy and Matter: Flows, Cycles, and Conservation: The National Research Council states that "tracking fluxes of energy and matter into, out of, and within systems helps one understand the systems' possibilities and limitations" (p. 84). *Energy is used to increase the rate of dissolving in solutions through an increase in temperature and stirring.* 7. Stability and Change: The National Research Council states that "for natural and built systems alike, conditions of stability and determinants of rates of change or evolution of a system are critical elements of study" (p. 84). *Rates of dissolving and physical properties determine stability and change. When two substances are mixed the total mass does not change.*

**Teachers have the discretion to enhance the selected SEP's and CCC's.*

Prior Knowledge
• 2.P.3 Observable properties of solids, liquids, and gases.
Subsequent Knowledge
• 7.P.2 Structures and properties of matter and conservation of matter.

Possible Instructional Strategies/Lessons

Strategies and lessons that will enable students to master the standard and/or indicator.

- 5.P.2B.1 Mix it Up This lesson introduces the properties of mixtures and solutions. Students compare and contrast the physical characteristics of a few simple mixtures and solutions. Students discuss the separation of mixtures and solutions back into their original states. This resource can be found at: https://www.teachengineering.org/lessons/view/cub_mix_lesson3

- 5.P.2B.2 Mixing Mass (See appendices) This students will mix various materials and determine how the mass of the parts of the mixture relate to the total mass of the mixture.

- 5.P.2B.3 Fireworks in a Jar This resource can be found at: http://www.icanteachmychild.com/fireworks-in-a-jar/ Students will create a model of fireworks in a jar and use observations to describe the mixture. Students can create a visual model of the mixture.

- 5.P.2B.4 Solubility and Concentration This baking soda, sugar, and water experiment defines solubility and concentration and explains how to calculate it. Lesson plans, examples including data charts, and video are included. This resource can be found at: http://www.ck12.org/user:Z2VsaWFzd2FycmVuQGNncHMub3Jn/book/CGPS-5th-grade/section/15.2/

- 5.P.2B.5 Rates of dissolving (See appendices) Students will participate in investigations to determine how different variables (including temperature change, particle size, and stirring) affect the rate of dissolving. Student worksheet is provided in this link: http://www.hofstra.edu/pdf/Academics/Colleges/SEAS/ctl/MISP/MiSP_Solubility_Worksheet_1_L1_Jul11.pdf

- 5.P.2B.6 Paper Chromatography Lab Marker and paper lab that introduces students to scientific techniques used by Crime Scene Investigators to identify what pen is used to write notes, such as those found at a crime scene. This resource can be found at: http://stem-works.com/subjects/10-crime-scene-investigation/activities/354

- 5.P.2B.6 Are Black Markers Really Black? Students use water soluble ink and paper to separate the colors of black. This lab demonstrates how primary colors are combined. This resource can be found at: http://tinkerlab.com/are-black-markers-really-black/

- 5.P.2B.6 Separating Mixtures Challenge Students design a method to separate a specific mixture. This resource can be found at: http://education.ucsc.edu/ellisa/case_studies/separating_mixtures_challenge.html

- 5.P.2B.6 Separating Mixtures (See appendices) This lesson allows students to plan and experiment how to separate a mixture of sand, rocks, and iron filings.

Resources

- Mixtures and Solutions Informative slideshare/powerpoint presentation on mixtures and solutions. This resource can be found at: http://www.slideshare.net/rbosch/mixtures-and-solutions-lesson-1

- Mixture Basics Informative site containing details and illustrations about mixtures. This resource can be found at: http://www.chem4kids.com/files/matter_mixture.html

- Separating Mixtures Video describing the different ways to separate mixtures. This resource can be found at: https://www.youtube.com/watch?v=DZtEGVNDudU

Sample Formative Assessment Tasks/Questions

Additional sample formative assessment tasks/questions for grade bands are located at the end of each of the SEP Support Doc (http://ed.sc.gov/scdoe/assets/File/instruction/standards/Science/Support%20Documents/Complete_2014SEPsGuide_SupportDoc2_0.pdf)

- Constructed Response

  Fifty (50) grams of salt and 2 grams of baking soda are mixed together. The mixture is weighed. What do you expect the mass of the mixture to be? Why?

  A student measures the weight of an ice cube and then lets it melt. What would you expect the weight of the water produced to be? Why?

  What does a physical property tell you about a substance?

You are cooking in your kitchen and think you have made a mixture by adding two substances together. How do you know it is a mixture?

- Oil Spill Solutions: This project explains pollutions and encourages the students to plan techniques for cleaning an oil spill (separating mixtures). The full lesson can be found at: http://tryengineering.org/lesson-plans/oil-spill-solutions

- Draw a model of a mixture that is a solution and list the materials that make the solution. Draw another model of a mixture that is not a solution and list the materials that make that mixture. Describe the properties of each of the mixtures by giving one way they are alike and one way they are different.

- Sam was making sweet tea for 3 of his friends. He was adding large sugar cubes to the pitcher of tea and waiting for it to dissolve. His friends were all very thirsty. They suggested different ways to get the sugar to dissolve faster. Which of his friends had an idea that would work? Explain your answer.
  Friend One said to break the sugar into smaller pieces. He said it would dissolve faster.
  Friend Two said to heat up the tea to get the sugar to dissolve faster. He told Sam he could add ice to it to get it cold again.
  Friend Three said to stir the tea. He said stirring it would make it dissolve faster.

- John put several spoons of salt in 125 mL of water and stirred it during his science investigation. The salt seemed to disappear. After John stirred the water he realized he had not measured the mass of the salt and recorded the amount in his science notebook. What happened to the salt? How could John find out the mass of the salt he put in the water?

What happened to the salt and what is the combination of salt and water called?

_____
_____

How could John find out the mass of the salt?

_____
_____

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Fifth Grade—Matter and Mixtures

Mixing Mass

Materials:

- Chocolate candies (M&Ms)
- Fruit candies (Skittles)
- Goldfish
- Hard candies (Smarties)
- Pan Balance with gram weights or digital scale set to measure in grams (best option)
- Small cups or plates
- Bowls
- Powdered drink mix
- Graduated Cylinder or beaker
- Water
- Measuring spoon
- Stirring spoon

Procedures:

Activity 1:
In groups, the students will make a mixture from 3 of the first 4 materials. As the students select their ingredients, they will measure the mass of each ingredient and record their findings on their data sheet. The ingredients should measure a total of 150 grams. When they have exactly 150 grams of ingredients, they will mix the ingredients in a bowl and measure the mass of the completed mixture. The students should then compare the before and after measurements. They should notice that the amounts are the same, which they means the mass did not change. Using this information, the students should construct an explanation and draw a diagram that supports these phenomena. *If allowed, the students may share and eat the mixture.

Activity 2:
In groups, the students will measure the mass of one tablespoon of the powdered drink mix. Before mixing it add 100 mL water into a clean beaker. Have them predict how the mass of the water and drink mix will change when they are combined. Using a digital scale set to measure in grams, measure the mass of the mixture. The students should have recorded the mass of each part of the mixture and then the total, to compare what happened to the mass when the materials were combined. You may extend this experiment by combining different amounts of the powdered drink mix each time

Fifth Grade—Matter and Mixtures

Mixing Mass

Standard
5.P2 The student will demonstrate an understanding of the physical properties of matter and mixtures.

Conceptual Understanding
5.P.2B. A mixture is formed when two or more kinds of matter are put together. Sometimes when two or more different substances are mixed together, a new substance with different properties may be formed but the total amount (mass) of the substances is conserved. Solutions are a special type of mixture in which one substance is dissolved evenly into another substance. When the physical properties of the components in a mixture are not changed, they can be separated in different physical ways.

Performance Indicator
5.P.2B.2 *Analyze and interpret* data to support claims that when two substances are mixed the total amount (mass) of the substances does not change.

Science and Engineering Practice
5.S.1.A.4 Analyze and interpret data from informational texts, observations, measurements, or investigations using a range of methods (such as tabulation or graphing) to (1) reveal patterns and construct meaning or (2) support hypotheses, explanations, claims, or designs

Cross Cutting Concepts
5. Energy and Matter: Flows, Cycles, and Conservation**:** The National Research Council (2012) states "tracking fluxes of energy and matter into, out of, and within systems helps one understand the systems' possibilities and limitations" (p. 84). *Processes involved in the changes of states of matter, mixtures, and solutions.*

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Fifth Grade—Matter and Mixtures

Rate of Dissolving

Materials:

- Water
- Cups
- Sugar
- Stirrer/spoon
- Beakers
- Digital Scale (in grams) or Pan Balance with gram weights
- Heat source for the water
- Timer
- Student worksheets/paper/notebook and pencil or devices if you are paperless
- If you have access to goggles, have the students wear them.
- Materials for the "Effects of different solvent" section if you are using it as an extension

Procedures:

Before you begin this activity you need to decide if you would like this to be done in small groups or with partners and if each group will test all variables or just one. The "Effects of different solvent" section can be used as an extension, since it not directly part of this indicator. *If you follow the worksheet provided in the link you will need to set up for the demonstration.

Demonstration:

Place 1 gram of sugar in a beaker containing 200 milliliters of water. Have students time how long it takes to dissolve (with no changing of variables), if it does dissolve. They may record their observations on a class recording sheet or on the top part of the worksheet. Then divide the students into groups (or partners), and explain that each group will be assigned one of these factors (variables) to test. Do not add your sugar to the water until you are given a signal to do so.

Group 1: Heat

You will be given a beaker with 200 ml of hot water and a container with 1 gram of sugar. When given the signal, add the sugar to the water. Do not shake or stir the water. Time how long it takes for all of the sugar to be dissolved. Record your results.

Group 2: Volume

You will be given a beaker with 400 ml room temperature water and a container with 1 gram of sugar. When given the signal, add the sugar to the water. Do not shake or stir the water. Time how long it takes for all of the sugar to be dissolved. Record your results.

Fifth Grade—Matter and Mixtures

Rate of Dissolving

Group 3: Stir

You will be given a beaker with 200 ml of room temperature water, a container with 1 gram of sugar, and a stirring rod. When given the signal, add the sugar to the water and begin stirring. Stop every 30 sec to see if the sugar is dissolved. Time how long it takes for all of the sugar to be dissolved. Record your results.

Once each group is finished they should report out their results. As a class, determine which method caused the greatest increase in the rate at which the sugar dissolved. Record the class results.

Standard
5.P2 The student will demonstrate an understanding of the physical properties of matter and mixtures.

Conceptual Understanding
5.P.2B. A mixture is formed when two or more kinds of matter are put together. Sometimes when two or more different substances are mixed together, a new substance with different properties may be formed but the total amount (mass) of the substances is conserved. Solutions are a special type of mixture in which one substance is dissolved evenly into another substance. When the physical properties of the components in a mixture are not changed, they can be separated in different physical ways.

Performance Indicator
5.P.2B.5 *Conduct controlled scientific investigations* to test how different variables (including temperature change, particle size, and stirring) affect the rate of dissolving.

Science and Engineering Practice
5.S.1A.3 Plan and conduct controlled scientific investigations to answer questions, test hypotheses and predictions, and develop explanations: (1) formulate scientific questions and testable hypotheses, (2) identify materials, procedures, and variables, (3) select and use appropriate tools or instruments to collect qualitative and quantitative data, and (4) record and represent data in an appropriate form. Use appropriate safety procedures.

Crosscutting Concepts
5. Energy and Matter: Flows, Cycles, and Conservation: The National Research Council (2012) states "tracking fluxes of energy and matter into, out of, and within systems helps one understand the systems' possibilities and limitations" (p. 84). *Energy is used to increase the rate of dissolving in solutions through an increase in temperature and stirring.*

References:

Solubility Worksheet #1. [PDF]. (n.d.) Retrieved August 24, 2016 from http://www.hofstra.edu/pdf/Academics/Colleges/SEAS/ctl/MISP/MiSP_Solubility_Worksheet_1_L1_Jul11.pdf

South Carolina Department of Education. (2015). South Carolina Academic Standards and Performance Indicators for Science 2014. Retrieved from http://ed.sc.gov/scdoe/assets/file/agency/ccr/StandardsLearning/documents/South_Carolina_Academic_Standards_and_Performance_Indicators_for_Science_2014.pdf

Fifth Grade—Matter and Mixtures

Separating Mixtures

Materials:

- Sand
- Iron Filings
- Small pebbles/rocks
- Small container (such as the clear plastic salad containers from the cafeteria)
- Magnets
- Sieve/sifter
- Bowls or trays to catch sand and iron mixture after sifting
- *If you want to increase the difficulty or give them other options you can include a filter (filter paper) and water
- Paper/notebook and pencil or devices
- If you have access to goggles, have the students wear them.

Procedures:

Prior to the Activity mix sand, iron filings, and rocks in a container. Also make sure you have all materials organized and accessible. You may also want to decide if you want the students to complete this activity in small groups or with a partner.

On the day of the Activity, give each group of students a container with the mixture, a sifter or sieve, a magnet, two bowls or trays to catch the sand and iron filings, the extra tools if you choose to use, and goggles. Instruct the students that there are three materials in the container and they must separate them all into their own containers. Tell the students they have just the tools in front of them to separate the mixture. They may use all of the tools or only some of them. To incorporate the Engineering Design Process, have the students plan how they will separate the mixture first. They may write or draw their plan. They should then try out their plan. If they have to make adjustments in the plan, they should note them in their design. Once they have separated all three materials into separate containers, the students should write or draw how they separated the mixture, being specific about what tools they used for each step of the plan, and what the individual materials are/look like separately. After they have cleaned up, allow the groups to communicate how they separated the mixture to the class.

Fifth Grade—Matter and Mixtures

Separating Mixtures

Standard
5.P2 The student will demonstrate an understanding of the physical properties of matter and mixtures.

Conceptual Understanding
5.P.2B. A mixture is formed when two or more kinds of matter are put together. Sometimes when two or more different substances are mixed together, a new substance with different properties may be formed but the total amount (mass) of the substances is conserved. Solutions are a special type of mixture in which one substance is dissolved evenly into another substance. When the physical properties of the components in a mixture are not changed, they can be separated in different physical ways.

Performance Indicator
5.P.2B.6 ***Design and test*** the appropriate method(s) (such as filtration, sifting, attraction to magnets, evaporation, chromatography, or floatation) for separating various mixtures to describe what happens to the properties of substances when two or more substances are mixed together.

Science and Engineering Practice
5.S.1A.3 Plan and conduct controlled scientific investigations to answer questions, test hypotheses and predictions, and develop explanations: (1) formulate scientific questions and testable hypotheses, (2) identify materials, procedures, and variables, (3) select and use appropriate tools or instruments to collect qualitative and quantitative data, and (4) record and represent data in an appropriate form. Use appropriate safety procedures.
5.S.1.A.4 Analyze and interpret data from informational texts, observations, measurements, or investigations using a range of methods (such as tabulation or graphing) to (1) reveal patterns and construct meaning or (2) support hypotheses, explanations, claims, or designs
5.S.1.A.6 Construct explanations of phenomena using (1) scientific evidence and models, (2) conclusions from scientific investigations, (3) predictions based on observations and measurements, or (4) data communicated in graphs, tables, or diagrams.

Cross Cutting Concepts
2. Cause and Effect: The National Research Council (2012) states "events have causes, sometimes simple, sometimes multifaceted. A major activity of science is investigating and explaining causal relationships and the mechanisms by which they are mediated. Such mechanisms can then be tested across given contexts and used to predict and explain events in new contexts" (p. 84). *Effects of mixtures are based on properties and physical change.*
5. Energy and Matter: Flows, Cycles, and Conservation: The National Research Council states that "tracking fluxes of energy and matter into, out of, and within systems helps one understand the systems' possibilities and limitations" (p. 84). *Energy is used to increase the rate of dissolving in solutions through an increase in temperature and stirring.*
7. Stability and Change: The National Research Council states that "for natural and built systems alike, conditions of stability and determinants of rates of change or evolution of a system are critical elements of study" (p. 84). *Rates of dissolving and physical properties determine stability and change. When two substances are mixed the total mass does not change.*

Reference

South Carolina Department of Education. (2015). South Carolina Academic Standards and Performance Indicators for Science 2014. Retrieved from http://ed.sc.gov/scdoe/assets/file/agency/ccr/StandardsLearning/documents/South_Carolina_Academic_Standards_and_Performance_Indicators_for_Science_2014.pd